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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.      | CONFIRMATION NO. |
|--|-------------|----------------------|--------------------------|------------------|
| 10/607,116   | 06/26/2003  | Michael J. Berman    | 03-0538                  | 3693             |
| 24319  | 7590        | 04/28/2005           | EXAMINER                 |                  |
| LSI LOGIC CORPORATION<br>1621 BARBER LANE<br>MS: D-106<br>MILPITAS, CA 95035 |             |                      | NGUYEN, GEORGE BINH MINH |                  |
|  |             |                      | ART UNIT                 | PAPER NUMBER     |
|  |             |                      | 3723                     |                  |

DATE MAILED: 04/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/607,116

Applicant(s)

BERMAN, MICHAEL J.

Examiner

George Nguyen

Art Unit

3723

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

**A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.**

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4, 6 and 7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Receipt is acknowledged of Applicant's RCE filed on March 23, 2005.

Claims 1-4 and 6-7 are presented for examination.

#### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 23, 2005 has been entered.

#### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drill et al. '6,347,979 in view of Tanaka'5,902,173.

With reference to Figure 6B, col. 7, line 39 to col. 8, line 67, Drill discloses the claimed invention including: a) a wear ring 312; b) at least one inlet 611; c) arm 306 including a manifold adapted to provide slurry only to the slurry dispense holes 611. It is noted that a manifold is defined in the Webster Dictionary as a pipe or channel to connect one inlet to a plurality of outlets; and d) a plurality of outlets 411. However, Drill does not disclose

Art Unit: 3723

at least one channel located inside the wear ring in communication with the plurality of outlets 411.

US 6,347,979 B1

7

texture of the surface of the polishing pad 302 and is transported under the surface of the wafer 311 as both the polishing pad 302 and the wafer 311 rotate. Consumed slurry and polishing by-products, in a similar manner, also adhere to the surface of the polishing pad 302 and are transported away from the surface of the wafer 311. As the polishing process continues, fresh slurry is continually dispensed onto the polishing pad by dispensing ring 312. The polishing process continues until the wafer 311 is sufficiently planarized and removed from the polishing pad 302.

By dispensing slurry directly into contact with wafer 311, dispensing ring 312 reduces the waste of slurry in the CMP process of CMP machine 300. The slurry is "targeted" directly onto wafer 311. In so doing, dispensing ring 312 renders the CMP process more cost effective by using slurry in the most efficient manner. Dispensing ring 312 of the present invention is shown in more detail in FIGS. 4A and 4B below.

FIG. 4A and FIG. 4B show a down view of dispensing ring 312 and a side view of dispensing ring 312 respectively. As depicted in FIGS. 4A and 4B, dispensing ring 312 of the present embodiment has a diameter 403, a lower surface 406 substantially parallel to the plane defined by the diameter 403, and an inner radius surface 402 substantially orthogonal to the plane defined by the diameter 403. The inner radius surface 402 is adapted to confine the semiconductor wafer (e.g., wafer 311). An outer radius surface 401 is located opposite the inner radius surface 402. An upper surface 405 is located opposite the lower surface 406.

In the present embodiment, a plurality of slurry dispense holes 411 extend through the dispensing ring 312 from the upper surface 405 to the lower surface 406, wherein the slurry dispense holes are adapted to flow slurry from the CMP machine 300 to the lower surface 406 so that the slurry contacts the wafer 311 confined within the inner radius surface 402. As described above, this provides for the more efficient utilization of slurry in the CMP process and minimizes the amount of wasted slurry.

FIG. 5 shows a down view of dispensing ring 312 and wafer 311 on polishing pad 302 as wafer 311 is being polished and dispensing ring 312 is dispensing slurry. As described above, slurry is flowed into contact with wafer 311 via the slurry dispense holes 411. This provides a more targeted delivery of slurry to wafer 311 and eliminates the need for coating the entire surface of pad 302 with slurry.

With reference now to FIG. 6A and FIG. 6B, FIG. 6A shows a side cut away view of wafer 311 and dispensing ring 312, as wafer 311 and dispensing ring 312 are positioned on top of pad 302. FIG. 6A also shows an area 600, which is shown in greater detail in FIG. 6B. As depicted in FIG. 6B, area 600 shows wafer 311 receiving a downward directed force from the carrier (not shown). Wafer 311 is confined in place on pad 302 by inner radius surface 402. Dispensing ring 312 receives a downward force from arm 306 and is pressed into the resilient surface of pad 302.

In the present embodiment, arm 306 includes a plurality of slurry passages (e.g., passage 601) which align with each of the slurry dispense holes 411. CMP machine 300 pumps slurry through the slurry passages 601, through the slurry dispense holes 411, onto pad 302, and into contact with wafer 311.

FIG. 6B depicts the case where the carrier ring used in a CMP process has a negative amount of protrusion into the surface of polishing pad 302 with respect to the surface of wafer 311. As shown in FIG. 6B, the lower surface of dispensing ring 312 is pressed further into the resilient

8

surface of polishing pad 302 than the lower surface of wafer 311. This negative protrusion amount is used to reduce non-uniformity where the edges of wafer 311 tend to be polished away faster than the center of wafer 311. Many CMP machines used this negative protrusion crucial to decrease the relative force exerted by polishing pad 302 against the edges of wafer 311 in comparison to the force exerted against the center of wafer 311. This counteracts the fact that the edges of wafer 311 have a greater angular velocity (e.g., due to the rotation of wafer 311 by arm 306) on polishing pad 302 than the center of wafer 311. In prior art CMP machines the negative protrusion interfered with the flow of slurry to the surface of wafer 311. In contrast, the dispensing ring 312 of the present invention ensures slurry is delivered uniformly to wafer 311 regardless of any amount of negative protrusion.

It should be noted that slurry can be pumped through dispensing ring 312 in a symmetric or asymmetric manner. In the case where slurry is pumped through dispensing ring 312 in a symmetric manner, each of the slurry dispense holes 411 receives an amount of slurry from a corresponding slurry passage 601 in arm 306. Each of the slurry passages 601 delivers approximately the same amount of slurry to its respective hole of dispense holes 411. In the case where slurry is pumped through dispensing ring 312 in an asymmetric manner, only the slurry dispense holes 411 in a certain region of the dispensing ring 312 receive slurry as the wafer 311 is being polished.

For example, as polishing pad 302 rotates beneath wafer 311, slurry can be pumped to the slurry dispense holes 411 on the "leading-edge" of the dispensing ring 312 with respect to polishing pad 302. This provides the advantage of injecting slurry under the leading-edge of wafer 311 as wafer 311 slides across the surface of polishing pad 302. The slurry subsequently contacts the full surface of wafer 311 with even less waste. This is depicted in FIG. 7 below.

Referring now to FIG. 7, a detail view of dispensing ring 312, slurry dispense holes 411, and a dispensing region 701 is shown. As depicted in FIG. 7, the surface of polishing pad 302 slides underneath dispensing ring 312 from the right side of FIG. 7 to left side of FIG. 7. As described above, in the case of asymmetric slurry injection, slurry is dispensed through the dispense holes of region 701 only. In leading edge asymmetric slurry injection (hereafter referred to simply as leading-edge slurry injection), region 701 covers the leading-edge of dispense ring 312 as dispense ring 312 slides across the surface of polishing pad 302.

It should be noted that dispensing ring 312 rotates as it slides across the surface of polishing pad 302. Accordingly, new slurry dispense holes are constantly being rotated into dispensing region 701 (wherein region 701 remains fixed on the leading-edge of dispensing ring 312) and slurry dispense holes 411 are constantly being rotated out of dispensing region 701. These holes only receive slurry from arm 306 while they are within dispensing region 701. In this manner, fresh slurry is constantly injected underneath the leading-edge of wafer 311 as wafer 311 rotates with respect to polishing pad 302 and as wafer 311 slides across the surface of polishing pad 302.

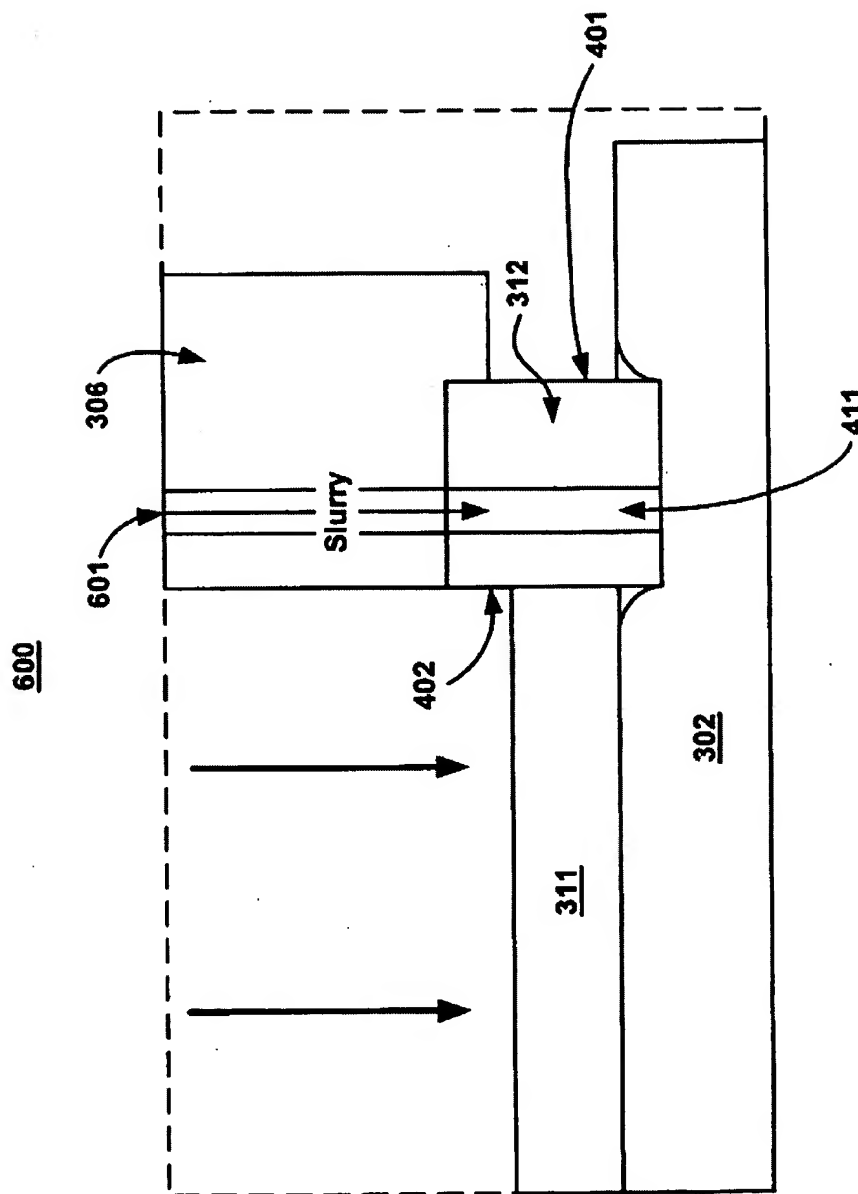
It should be noted that there are several means of implementing a dispensing region within dispensing ring 312. For example, arm 306 can include a manifold adapted to provide slurry only to those slurry dispense holes 411 which are in the correct region (e.g. within dispensing region 701). This manifold remains fixed even though dispensing ring 312 and wafer 311 are rotated with respect to polishing pad 302. Leading-edge slurry injection is graphically depicted in FIG. 8 below.

**U.S. Patent**

Feb. 19, 2002

Sheet 13 of 16

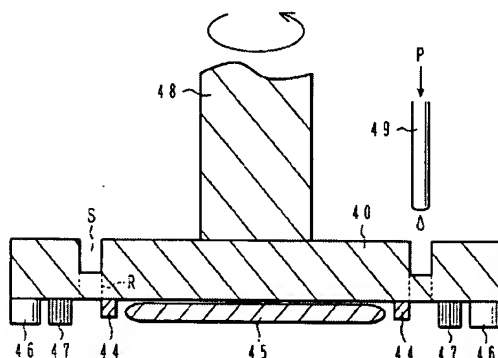
**US 6,347,979 B1**



**FIG. 6B**

Art Unit: 3723

With reference to Figure 22, col. 7, lines 43-59, Tanaka teaches that it is known to have utilized at least one channel S in communication with a number of holes R so that polishing agent P can be supplied therefore from a dispensing nozzle 49 to the wafer 45 via the groove S and holes R. The advantage is to provide a uniform slurry supply to the holes.



The feature of the tool/wafer holder 40 shown in FIG. 23 is that a tool holder unit 40b with a lapping tool 46 is rotated independently from a wafer holder unit 40a with a brush 47. Specifically, the lapping tool 46 is adhered to the bottom of the tool holder unit 40b which is mounted covering the wafer holder 40b, whereas the brush 47 is adhered to the bottom of the wafer holder unit 40a. The tool holder unit 40b is rotated by a rotary shaft 48b disposed coaxially with, and outside of, a rotary shaft 48a for rotating the wafer holder unit 40a. A groove Sa is formed in the tool holder unit 40b, and a groove S corresponding in position to the groove Sa is formed in the wafer holder unit 40a. A number of holes R are formed in the groove S, opening to the bottom surface of the wafer holding tool 40a. Polishing agent P can be supplied therefore from a dispensing nozzle 49 to the wafer 45 via the grooves Sa and S and holes R.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the wear ring 312 of Drill polishing apparatus with one common channel S connected to a plurality of outlets hole R to provide slurry to the polishing pad as taught by Tanaka in order to provide a uniform slurry supply to all outlet holes.

Regarding to the method claims, the steps would have been obvious by the functions of the prior art apparatus.

### ***Response to Arguments***

4. Applicant's arguments filed March 23, 2005 have been fully considered but they are not persuasive. Regarding to Applicant's argument that neither Drill nor Tanaka

teaches a channel inside a wear ring, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). As indicated in the above rejection, it is a well-known to have employed a channel or manifold to connect one inlet to a plurality of outlets for controlling purposes. Thus, the above 103 rejection deems to be proper because the motivation for the combination is implicitly stated in Tanaka. Supposedly, Drill or Tanaka discloses a channel inside the wear ring, and then the rejection would have been made under 102.

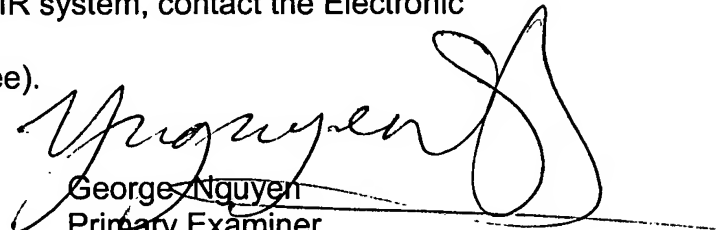
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Nguyen whose telephone number is 571-272-4491. The examiner can normally be reached on Monday-Friday/630AM-300PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Hail can be reached on 571-272-4485. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**GEORGE NGUYEN**  
**PRIMARY EXAMINER**

  
George Nguyen  
Primary Examiner  
Art Unit 3723

GN – April 26, 2005